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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/696,955	10/27/2000	Kazuyoshi Tamura	107703	3185

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EXAMINER

ANDERSON, MATTHEW A

ART UNIT

PAPER NUMBER

1765

DATE MAILED: 12/19/2002

12

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/696,955

Applicant(s)

TAMURA ET AL.

Examiner

Matthew A. Anderson

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 12 December 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-7 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-7 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 02 December 2002 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ 6) ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ke et al. (US 6,284,093 B1) in view of Wolf et al. (Vol. 1 pp. 8, 23-27, 32-33, 59, 1986) and Tamatsuka et al. (US 6,299,982 B1).

Ke et al. discloses a non-dielectric ring which surrounds a workpiece wafer in a plasma semiconductor processing chamber. The ring is disclosed as consisting of Si of the single crystal variety in col. 6 lines 31-38. In col. 14 lines 66+ and col. 15 lines 1-10 the cylindrically symmetrical nature of the ring with respect to the wafer axis is disclosed.

Ke et al. does not disclose the oxygen or nitrogen concentration in the ring or the method of forming the ring.

Wolf et al. discloses known Si processing methods. Cz silicon was shown on page 8 to be well known. On page 23-25 disclose methods of forming wafers. Etching of the surface to remove contamination and damage from metal working is also disclosed. Etching of On page 32 is disclosed the incorporation of oxygen and nitrogen

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into Cz silicon to increase the warpage resistance of the Si. This warpage resistance would be of great value in a batch processing chamber such as that described by Ke et al. In pages 531-532, acidic and alkaline etchants are described including aqueous mixtures of HNO_3 , HF, Acetic Acid (CH_3COOH) and KOH /isopropyl alcohol. Water is described as a common diluent for etchants.

It would have been obvious to one of ordinary skill in the art at the time of the present invention to combine Ke et al. and Wolf et al. because Ke et al. discloses Si mono-crystalline focus rings and Wolf et al. discloses known ways of working with and improving the warpage resistance of items formed from such Si.

The combination does not specify a ring with certain atomic concentrations of oxygen or nitrogen.

Tamatsuka et al. discloses Si wafers made from a Cz Si ingot which has nitrogen concentration of 1×10^{10} atoms/cm³ to 5×10^{15} atoms/cm³ and a oxygen concentration of 1×10^{18} atoms/cm³.

It would have been obvious to one of ordinary skill in the art at the time of the present invention to combine the Si of Tamatsuka with the previous combination because Wolf et al. discloses the superior warpage resistance of Si doped with oxygen and nitrogen.

It would have been obvious to one of ordinary skill in the art at the time of the present invention to use a monocrystalline Si focus ring with a nitrogen concentration of 5×10^{13} atoms/cm³ to 5×10^{15} atoms/cm³ and a oxygen concentration of 5×10^{17} atoms/cm³ to 1.5×10^{18} atoms/cm³ because Si rings were known, such doping concentration of N

and O was known for Si, and it was known that N and O increased the warpage resistance of Si.

It would have been obvious to one of ordinary skill in the art at the time of the present invention to etch the surface of the focus ring with either acidic or alkaline etchants because etching the surface of Si to remove processing damage and contamination was known to Wolf et al.

As far as the process for the production of the focus ring, it would have been obvious to one of ordinary skill in the art at the time of the present invention to form a ring from Cz monocrystalline Si because Ke et al. discloses such a shape, Wolf et al. discloses metalworking of Si, Tamatsuka et al. discloses Si with such doping concentrations and one of ordinary skill in the art would have been able to bore a hole thus producing a ring as in Ke et al.

Response to Arguments

2. Applicant's arguments filed 12/04/2002 have been fully considered but they are not persuasive.

The applicant's argument that Ke does not contain every aspect of the applicant's claim is noted but is not convincing. The examiner's rejection is based on a combination and is set forth with a motivation for that combination. Ke uses a pure Si focus ring. Wolf et al. discloses known methods of producing Si in shapes having a round outer perimeter (i.e. a ring). Wolf et al. also discloses the oxygen concentrations of grown single-crystal Si which is in the range claimed by the applicants. The examiner

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must infer from this evidence that one of ordinary skill in the art would have found it obvious that Si pure enough for forming semiconductor wafers and devices thereon is pure enough to form a focus ring used in an semiconductor wafer etching chamber. This is so because Ke et al. uses the Si focus ring for holding semiconducting Si wafers (see col. 3 lines 10-20).

The teaching away argument falls apart since the oxygen concentration is that inherently found in Si produced by the extremely common Cz process. No modification is needed for the oxygen content and Nitrogen additions to Si where also known.

In response to applicant's argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, single crystalline Si with the claimed oxygen concentration was known to those of ordinary skill in the art. Motivation was cited in the previous action as the known increase in mechanical strength associated with the presence of oxygen in Si (Wolf et al. page 32). The applicant's argument that improved strength was not a concern of Ke is noted. However, Ke states in col. 6 lines 30-50 that the focus ring be Si because this would increase the life of that ring. Ke also states "single crystal Si is preferred because it can be obtained with the highest purity". Ke does not limit the single crystal to as to its

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oxygen It would also be expected by those of ordinary skill in the art that the life of the ring would be extended by the increased mechanical strength imparted to the Si by the presence of known amounts of oxygen.

The argument that Wolf et al. does not suggest a focus ring is not convincing in that the rejection was based on a combination of references. Wolf et al. does disclose the specific oxygen concentrations in single crystal Si. Wolf also disclose etching of Si to remove impurities and damage (page 25 step h).

The argument against Tamatsuka is noted. Again, the rejection is based on a combination of references. Tamatsuka combined with Ke suggests to one of ordinary skill using the Si for a ring since this would require only simple milling work of forming a hole.

In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., gettering effect) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993). Until this feature appears in the claims, the examiner will not be drawn into a discussing of the gettering effect.

The applicant's argument that the conventional focus ring is pure Si therefore the ring of the present invention is not obvious is not convincing. The conventional method of making single crystal Si (i.e. the Cz method) inherently includes oxygen at approximately 10-20 parts per million (Wolf et al. page 59) or equivalently 5×10^{17}

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to 1×10^{18} atoms/cm³. Ke does not have to introduce oxygen because it is known to be there inherently from the process.

The applicant's cited "disadvantages" of Ke concerning oxygen in the focus ring concern quartz or SiO₂ rings, which, when etched, release about 666,666 parts per million oxygen. 10 to 20 ppma is by comparison miniscule.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew A. Anderson whose telephone number is (703) 308-0086. The examiner can normally be reached on M-Th, 6:30-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Benjamin Utech can be reached on (703) 308-3836. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9310 for regular communications and (703) 872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

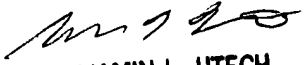
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MAA

December 18, 2002


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